United States Patent and Trademark Office

Examiner: Zhang, J. Art Unit: 2838 Docket No. 3283

In re:

Applicant: ETZOLD, P.

Serial No.: 10/531,516

Filed: April 15, 2005

APPEAL BRIEF

December 20, 2007

Hon. Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sirs:

The Appellant submit the following for his brief on appeal and respectfully request consideration of same. The Appellant requests withdrawal of the rejections made and that the Application be placed in line for Allowance.

I. REAL PARTY IN INTEREST

The real party in interest in the instant application is the assignee of the application, Robert Bosch GmbH, Stuttgart, Germany.

II. RELATED APPEALS AND INTERFERENCES

The Appellant is unaware of any related appeals or interferences with regard to the application.

III. STATUS OF CLAIMS

Claims 1-18 are rejected. Claims 1-18 are appealed.

IV. STATUS OF AMENDMENTS

A Final Office Action finally rejecting claims 1-18 was mailed on July 9, 2007. A Request for Reconsideration was submitted on September 28, 2007, in which only further arguments as to the patentability of claims 1-18 were presented. An Advisory Action was mailed October 11, 2007, in which the final rejection of claims 1-18 was maintained.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 defines a method for operating a line-supplied charger (100) for a battery (200) in a maintaining mode for keeping the battery in a charged state, in which the battery (200) alternates cyclically between a resting phase (R) and a refreshing phase (A) (specification, page 2, line 33, through

page 3, line 14; Fig. 1). The battery (200), in the resting phase (R), from self-discharging of the battery (200), discharges from an upper threshold voltage (U_{OG}) to a lower threshold voltage (U_{UG}) which is lower than the upper threshold voltage (U_{OG}) but is preferably higher than the rated voltage of the battery (200) (page 4, lines 8-21; Fig. 1). The battery (200), in the refreshing phase (A), is charged again from the lower (U_{UG}) to the upper threshold voltage (U_{OG}) via a charge transformer (120) of the charger (100) (page 6, line 12, through page 7, line 9; Figs. 2a, 2b, 2c). Individual components of the charger (100) comprising at least the charge transformer (12), are separated from the line voltage (U_N) during the resting phase (R) (page 8, lines 10-22; Figs. 2a, 2b, 2c).

Independent claim 9 defines a charger (100) for charging a battery (200) from a line voltage (U_N), including a charge transformer (120) for transforming the primary line voltage (U_N) into a secondary voltage; a rectifier (130), which is connected downstream of the charge transformer (120) on its secondary side, for furnishing a charging voltage (U_B) for the battery from the secondary voltage; and a control unit (150) for triggering the rectifier (130) via a control signal (S1) in response to the charging voltage (U_B), in particular in such a way that the battery (200), after its charging phase, is kept in its charged state in that the battery (200) alternates cyclically between a resting phase (R) (page 9, lines 5-13; Figs. 1 and 3). The battery (200) from self-discharging of the battery (200) discharges from an upper threshold voltage (U_{OG}) to a lower threshold voltage (U_{UG}) which is lower than the upper threshold voltage (U_{OG}) but greater than the line voltage of the battery (200) (page 9, lines 5-34; Figs. 1 and 3), In a refreshing phase (A),

the battery (200) is charged again from the lower (U_{UG}) to the upper threshold voltage (U_{OG}) via the charge transformer (120) of the charger (100). A first comparator (160) is provided for generating a first comparison signal (V1), when the battery voltage (U_B) at the end of the refreshing phase has reached or exceeded the upper threshold voltage (U_{OG}) (page 4, line 19, through page 5, line 5; Figs. 1 and 3). A switching device (110) separates at least the charge transformer (120), during the resting phase (R), from the line voltage (U_N) in response to a switching signal (S2), which represents the first comparison signal (V1) (page 8, lines 10-22, Figs. 1 and 3)..

VI. <u>GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL</u>

1. Whether claims 1-12 and 16-17 are unpatentable under 35 U.S.C. 103(a) over Keidl et al in view of Wu (US PG Pub No. 20020109485);

2. Whether claims 13-14 are unpatentable under 35 U.S.C. 103(a) over Keidl et al in view of Wu and further in view of U.S. Patent No. 5,459,652 to Faulk;

3. Whether claim 15 is unpatentable 35 U.S.C. 103(a) over Keidl et al in view of Wu, further in view of Faulk, and further in view of U.S. Patent No. 6,434,025 to Shiral et al;

4. Whether claim 18 is unpatentable 35 U.S.C. 103(a) over Keidl et al in view of Wu, further in view of U.S. Patent No. 5,345,094 to Usui et al.

VII. ARGUMENT

1) Independent claims 1 and 9 are not obvious over the combination of the Keidl et al and Wu references.

In the final rejection, the Examiner is of the opinion that claims 1 to 12 and 16 to 17 are rendered obvious by US 5,617,007 to Keidl et al when taken in combination with the newly cited reference to Wu. The Examiner states that Keidl discloses almost all of the features of pending claim 1, with the exception of the feature, according to which the charge transformer is separated from the line voltage during the resting phase. It is, however, according to the Examiner, well known to separate a charge transformer from the line voltage.

For example, the Examiner argues, Wu discloses a battery charging device (see Fig. 2 and the abstract of this reference), which uses a switch (SW1) for separating the charge transformer (1) from the line voltage during a phase, in which the battery is not charged (so-called "non-conductive time period"). Further, the Examiner maintains that this reference teaches that the charging voltage during a so-called "conductive period" is used for charging the battery and that the current of the battery is disconnected during the "non-conductive period" (see paragraphs [0032] and [0025]).

According to the Examiner this renders obvious the subject-matter of pending claim 1. In particular, the Examiner argues that it is obvious for a person skilled in the art to use a switch for separating the charge transformer from the line voltage during a resting phase and to connect the charge transformer with the line voltage during a charging phase for charging the battery.

The Appellant respectfully disagrees with this analysis. The primary reference to Keidl discloses a so-called three phase charging process consisting of three consecutive phases to be used for charging a lead acid battery, thereby using a two-point switch in order to avoid stability problems for the charger feedback loop (see Keidl, column 1, line 60 to column 2, line 8 of Keidl). Keidl neither discloses nor suggests any kind of charge-maintaining mode during part of which the ***charging transformer is completely turned off*** for keeping the battery in a charged state after the charging process. By turning off the charging transformer, the self-discharging effects of the battery are significantly reduced almost to zero.

The three-phase charging process disclosed in Keidl comprises a constant current charge (phase 1), a constant voltage charge (phase 2) and a float voltage charge (phase 3). All three phases together serve for charging lead acid batteries in an efficient and timely manner (see Keidl, column 1, lines 12-13 and Fig. 3). Attached hereto is an excerpt from a technical document concerning the three-phase charging process as disclosed in Keidl. As the diagram indicates, the float voltage charge (phase 3) is indeed a phase in which the battery is charged with a constant current. The process disclosed in Keidl differs from the process shown in the diagram only in that a two-point switch is used for controlling the charging current during the float voltage charge (phase 3).

Therefore, the Appellant respectfully submits that Keidl only discloses a method for operating a line-supplied charger for a battery, in which during a charging mode, the battery, in a first phase, is charged with a constant current to

the upper threshold voltage and, in a second phase, is supplied with a constant charging voltage. This, however, has only very little to do with the present invention, which relates to the charge-maintaining mode following the charging mode, during which the charging transformer is completely turned off for most of the time, so-called "saw tooth maintaining charging".

An important aspect of the present invention is that during a resting phase (R) of the charge-maintaining mode, the current consumption and, therefore, the power loss of the entire charger is made to zero by decoupling the charging transformer from the rest of the circuit. During the resting phase, the battery voltage decreases due to self-discharging effects of the battery (and the extremely small current flowing through the comparator (170); see Fig. 1 of the present application), for example, from 14.4 V to 12.8 V. The resting phase can last for many hours or even up to a few days. The present invention reduces the stand-by losses of a battery (in the resting phase) to the minimum, thereby extending the duration of the resting phase to a maximum.

The stand-by losses are particularly high with convention chargers with 50/60 Hz transformers. Therefore, the present invention preferably is used with chargers with 50/60 Hz transformers. However, the present invention can be realized and has the advantages with all kinds of chargers having the function "saw tooth maintaining charging".

The charger disclosed in Keidl comprises a switching device (FET 32). However, the switching device (32) only serves for activating and/or deactivating the charging circuit (24). In particular, the switching device (32) cannot separate

the charge transformer (36) from the line voltage (VIN). Therefore, even if the float voltage charge phase of the three phase charging process disclosed in Keidl could be regarded as a charge-maintaining mode in the sense of the present invention, Keidl still would not anticipate the subject matter of independent claims 1 and 9 in their entirety, because the transformer (36) of the Keidl charger (10) in the stand-by mode during the phase three is not decoupled from the rest of the circuit of the charger and still consumes a considerable amount of energy, leading to a relatively fast self-discharging of the battery. This is avoided with the present invention.

Furthermore, the Appellant emphasizes that the saw tooth characteristic of the battery voltage during the float voltage charge phase (see Fig. 3 of Keidl) actually has nothing to do with separating and connecting the charge transformer and the characteristic of the battery voltage according to Fig. 2a of the present application.

A conventional charger for realizing a three phase charging process charges the battery with a constant float voltage during the third phase of the charging process, as shown in the diagram of the attachment. Based on this known prior art, all Keidl does is to introduce a two-point closed loop control between 0.99 x Uf and 1.01 x Uf, in order to enhance the stability of the closed loop control. This clearly has nothing to do with separating and connecting the charge transformer from the battery during the resting phase of a charge-maintaining mode in order to reduce the self-discharging of the battery.

With regard to the reference to Wu, cited in combination with Keidl in the final rejection, Wu refers to a method for operating a mains-operated charger for a battery, wherein the battery is either charged (during the "conductive time period") or the battery is not charged (during the "non-conductive time period"). This reference does not disclose any kind of a refreshing phase, in which the charging of the battery is maintained at a more or less constant value by monitoring the charging value and cyclically charging the battery if the charging falls below a defined threshold. Wu merely teaches what is self-evident to a person skilled in the art anyway, namely to connect the charge transformer with the line voltage when charging the battery and to separate the charge transformer from the line voltage at the end of the charging phase.

Wu does not teach separating the charge transformer of all things ***during the resting phase of a maintaining mode for keeping the battery in a charged state***. The Appellant submits that the resting phase according to the present invention cannot be compared with the phase known from Wu subsequent to the charging phase and during which the battery is not charged at all. During the resting phase according to the invention the battery voltage is monitored. The battery self-discharges from an upper threshold voltage to a lower threshold voltage which is lower than the upper threshold voltage ***but is higher than the rated voltage of the battery***.

This is totally different in the phase disclosed in Wu, during which no charging of the battery what so ever is performed. During this phase the battery can discharge to any extent. In particular, it is possible and most probable that

within a relatively short time period the battery is discharged to a voltage below the nominal voltage of the battery, which of course can damage the battery.

Of course, it is known from the prior-art to separate a charge transformer at any point in time, preferably after the charging phase and as long as the battery is not charged, completely from the line voltage. The question is, however, if a person skilled in the art had a motivation to separate the charge transformer just during the resting phase of a maintaining mode. The practitioner skilled in the art would have no motivation whatsoever because neither Keidl nor Wu discloses the above feature

Rather, it is explicitly disclosed in paragraph [0026] of Wu that the control circuit (4) determines a battery voltage only ***at the end of the charging phase*** in order to determine whether or not a further charging phase is necessary directly after the completed charging phase. A further charging phase is, for example, necessary if the battery does not reach a defined voltage value at the end of the first charging phase. If, however, the battery voltage is beyond the defined voltage value at the end of the first charging phase, the control switch (SW1) is opened, in order to terminate the first charging phase. The charging phase is terminated once and for all. The time period after the charging phase cannot be regarded a resting phase of a maintaining mode in terms of the present invention because the battery is not refreshed (re-charged), as soon as the voltage falls below a lower threshold value, which is larger than the nominal voltage of the battery. During the period after the charging phase the voltage is not monitored, nor is there any determination of a necessity for a refresh of the battery.

Paragraph [0029] of Wu merely discloses that in the embodiment shown in Fig. 3 the battery charging device is used for starting a vehicle motor. For this purpose, the vehicle motor is connected with the line voltage by means of the switch (SW1) via an additional control circuit (5). Wu does not disclose terminating the phase following the charging phase as soon as the battery voltage falls below a lower threshold value, which is larger than the nominal voltage of the battery. Furthermore, a refreshing phase for recharging the battery on its higher threshold voltage again is not mentioned in Wu.

For the reasons set forth above, the Appellant therefore respectfully submits that independent claims 1 and 9, along with its respective dependent claims, are not rendered obvious by the cited reference combination. It is respectfully submitted that since the prior art does not suggest the desirability of the claimed invention, such art cannot establish a prima facie case of obviousness as clearly set forth in MPEP section 2143.01. Please note also that the modification proposed by the Examiner would change the principle of operation of the prior art, so that also for this reason the references are not sufficient to render the claims prima facie obvious (see the last paragraph of the aforementioned MPEP section 2143.01).

2. Claims 13-14 are not obvious over Keidl et al in view of Wu and Faulk.

Because claims 13 and 14 depend ultimately from independent claim 9, they each include all of the features of claim 9 and therefore are patentable for the same reasons as set forth above.

3. Claim 15 is not obvious over Keidl et al in view of Wu, Faulk, and Shiral et al.

Because claim 15 depends ultimately from independent claim 9, claim 15 includes all of the features of claim 9 and therefore is patentable for the same reasons as set forth above.

4. Claim 18 is not obvious over Keidl et al in view of Wu and Usui et al.

Because claim 18 depends from independent claim 9, claim 18 includes all of the features of claim 9 and therefore is patentable for the same reasons as set forth above.

In view of the foregoing discussion, it is respectfully requested that the Honorable Board of Patent Appeals and Interferences overrule the final rejection of claims 1-18 over the cited art, and hold that the Appellant's claims be allowable over such art.

Respectfully Submitted,

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VIII. CLAIMS APPENDIX

Copy of Claims Involved in the Appeal:

1. A method for operating a line-supplied charger (100) for a battery (200) in a maintaining mode for keeping the battery in a charged state, in which the battery (200) alternates cyclically between a resting phase (R) and a refreshing phase (A),

in which the battery (200), in the resting phase (R), from self-discharging of the battery (200), discharges from an upper threshold voltage (U_{OG}) to a lower threshold voltage (U_{UG}) which is lower than the upper threshold voltage (U_{OG}) but is preferably higher than the rated voltage of the battery (200); and

in which the battery (200), in the refreshing phase (A), is charged again from the lower (U_{UG}) to the upper threshold voltage (U_{OG}) via a charge transformer (120) of the charger (100);

wherein individual components of the charger (100) comprising at least the charge transformer (12), are separated from the line voltage (U_N) during the resting phase (R).

2. The method according to claim 1, wherein in the charge-maintaining mode, the alternation from the resting phase (R) to the refreshing phase (A) takes place whenever the battery voltage (U_B) has reached or undershot the lower threshold voltage (U_{UG}).

3. The method according to claim 1, wherein the battery (200) is charged with a predefined constant charging current (I_L) during the refreshing phase (A).

4. The method according to claim 1, wherein in the charge-maintaining mode, the alternation from the refreshing phase (A) to the resting phase (R) is effected whenever the battery (200) has been charged to the upper threshold voltage or above it.

5. The method according to claim 1, wherein the charge-maintaining mode is preceded by a charging mode (AL), in which the battery (200), in a first phase, is charged with a constant current to the upper threshold voltage (U_{OG}) and, in a second phase, is supplied with a constant charging voltage.

6. The method according to claim 5, wherein an alternation from the second phase of the charging mode to the charge-maintaining mode, in particular to the resting phase (R), takes place when the upper threshold voltage (U_{OG}) has been maintained with the aid of the constant charging voltage, and simultaneously the charging current has dropped to a predetermined value that is less than the value of the constant current in the first phase.

7. A computer program provided on a data medium and computer-readable by a battery charger, the computer program having a program code that is embodied for performing the method according to claim 1.

8. A data medium that is computer-readable by a battery charger and having a computer program according to claim 7.

9. A charger (100) for charging a battery (200) from a line voltage (U_N), including:

- a charge transformer (120) for transforming the primary line voltage (U_N) into a secondary voltage;

- a rectifier (130), which is connected downstream of the charge transformer (120) on its secondary side, for furnishing a charging voltage (U_B) for the battery from the secondary voltage; and

- a control unit (150) for triggering the rectifier (130) via a control signal (S1) in response to the charging voltage (U_B), in particular in such a way that the battery (200), after its charging phase, is kept in its charged state in that the battery (200) alternates cyclically between a resting phase (R), in which the battery (200) from self-discharging of the battery (200) discharges from an upper threshold voltage (U_{OG}) to a lower threshold voltage (U_{UG}) which is lower than the upper threshold voltage (U_{OG}) but greater than the line voltage of the battery (200), and a refreshing phase (A), in which the battery (200) is charged again

from the lower (U_{UG}) to the upper threshold voltage (U_{OG}) via the charge transformer (120) of the charger (100);

characterized by a first comparator (160) for generating a first comparison signal (V1), when the battery voltage (U_B) at the end of the refreshing phase has reached or exceeded the upper threshold voltage (U_{OG}); and

a switching device (110) for separating at least the charge transformer (120), during the resting phase (R), from the line voltage (U_N) in response to a switching signal (S2), which represents the first comparison signal (V1).

10. The charger (100) according to claim 9, characterized by a second comparator (170) for generating a second comparison signal (V2), when the battery voltage (U_B) at the end of the resting phase (R) has reached or undershot the lower threshold voltage (U_{UG}).

11. The charger (100) according to claim 10, characterized by an OR logic module (180) for furnishing the switching signal (S2) for the switching device (110) as an OR linkage from the first and the second comparison signals (V1, V2).

12. The charger according to claim 11, wherein the two comparison signals (V1, V2) are synchronized with one another in such a way that upon generation of the first comparison signal (V1), the second comparison signal (V2) is also

converted to a state such that the switching signal (S2) at the output of the OR logic module (180) assumes a state which opens the switching device (110).

13. The charger (100) according to claim 9, characterized by a supply transformer (140) for supplying the control unit (150), on its secondary side, with a supply voltage.

14. The charger according to claim 13, wherein the supply transformer (140) is connected downstream of the switching device (110) and with its primary side is connected parallel to the charge transformer (120).

15. The charger according to claim 13, wherein the supply transformer (140) is connected upstream of the switching device (110) and is coupled with its primary side to the line voltage (U_N).

16. The charger (100) according to claim 9, wherein the control unit, the first and second comparators (160, 170), and/or the OR logic module (180) are realized as an integrated circuit, preferably as a microcontroller or microprocessor with a suitable computer program.

17. The charger (100) according to claim 9, wherein the comparators (160, 170) are embodied by analog hardware.

18. The charger (100) according to claim 9, wherein the switching device (110) is embodied as an opto-triac.

IX. EVIDENCE APPENDIX

None.

X. <u>RELATED PROCEEDINGS APPENDIX</u>

None.